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Tomato leaves affected with late-blight.

Experiments in Spraying and Dusting Tomatoes

—BY—

F. D. FROMME

BLACKSBURG, MONTGOMERY COUNTY, VIRGINIA

EXPERIMENTS IN SPRAYING AND DUSTING TOMATOES

By F. D. Fromme

This bulletin describes spraying experiments for the control of tomato diseases conducted in Virginia during the seasons of 1918 and 1919, and a dusting experiment conducted in 1922.

The problem of disease control is one of major importance to the tomato grower in Virginia. The steady increase in prevalence and severity of disease, especially leaf-blight caused by *Septoria lycopersici*, within the last decade has involved such marked decrease in yields as to result in greatly restricted acreages and the abandonment of tomato culture on many farms.

Control of Leaf-Blight and Soft-Rot in 1918

EXPERIMENTS AT BLACKSBURG

The experiments were conducted at Blacksburg and were planned as a test of the soap Bordeaux developed by Pritchard and Clarke, (U. S. Department of Agriculture, Bur. Pl. Ind. C., T., and F. C. D. Circular 4, 1918) in comparison with standard Bordeaux. The variety used was Norton, a wilt-resistant selection of Stone. The plants were transplanted from 3-inch pots into the field on May 17, the planting distance being 4 by 5 feet. Each plat consisted of 104 plants and covered an area slightly larger than one-twentieth of an acre. The land had been used for tomatoes in the two preceding years and the presence of Septoria was thus assured.

The treatment of plats was as follows:

Plat A. Sprayed with soap Bordeaux, 5 applications.
Plat B. Sprayed with standard Bordeaux, 5 applications.
Plat C. Check.

The soap Bordeaux was prepared as by Pritchard and Clarke with 4 pounds of bluestone, 2 pounds of rosin fish-oil soap, 3 pounds of quick lime, and 50 gallons of water. The standard Bordeaux consisted of 5 pounds of bluestone and 5 pounds of quick lime in 50 gallons of water. All applications were made with a barrel sprayer equipped with a short rod and an angle nozzle with a fine disc. Equal quantities of solution were used on the two spray plats, the aim being to provide a uniform coating of material on all parts of the plants without overloading. This was accomplished much more readily with the soap Bordeaux, which spread and dried to form an even coating, while the non-soap Bordeaux tended to collect in drops and run off. The sticking qualities of the former material were also markedly superior.

The first spray was applied on July 6, about 7 weeks after transplanting. Subsequent applications were made on the following dates: July 15, 27, August 5, 20. The intervals between applications were 9, 12, 9 and 15 days, involving a period of 45 days in all.

Septoria spots on the foliage were first noted on July 27. Infection had become general in the check plat by August 5 and defoliation in this plat was practically complete by the first week in September. The contrast at this time between the plat sprayed with soap Bordeaux, plat A, and the check was very striking. Septoria spots were common in plat A, but there was but little leaf death and practically no defoliation. Plat B, sprayed with standard Bordeaux, was intermediate between plat A and the check, with a fairly good control of infection, but with considerably more leaf death and defoliation than plat A.

The season was unusually wet, with a total rainfall from August 12 to 31 of 7.57 inches distributed during 11 days.

Harvest began on August 14 and was terminated by frost on September 26. All sound, ripe fruit and unsound, ripe and green fruit were harvested on the different picking dates and the yields were recorded by weight as shown in Table 1. Practically all of the unsoundness was caused by bacterial soft-rot, a disease which is exceedingly common and often very destructive in tomato fields in Virginia. The soft-rot organism[1] is a wound parasite and quickly reduced green or ripening tomato fruits to a watery, rotting mass. Entrance is readily obtained through growth cracks at the stem-end, sun scalds and insect injuries.

The marked effect of soap Bordeaux in the control of soft-rot is shown in the table. There were 105 pounds of unsound fruit from the plat sprayed with this material as compared with 207 pounds for the standard Bordeaux plat, and 325 pounds for the check. The percentage control shown by the soap Bordeaux, in comparison with the check, was 68 per cent while that of standard Bordeaux was 36 per cent. No clear cut explanation for the greater efficiency of the soap Bordeaux is apparent. It may have been due to greater bactericidal properties of the spray material, to better covering and adhesion to the fruit, or possibly to foliage protection which decreased sun scald and which would promote more uniform growth of fruit, with fewer growth cracks.

The soft-rot occurred throughout the harvest period, but was especially destructive in late August and early September, as shown by the harvest records. In the harvest of September 2 the quantity of unsound fruits from the check plats greatly exceeded that of sound fruit, the ratio, on the basis of weight, being 1 to 2.2. In the Bordeaux plat the ratio is approximately 1 to 1, and in the soap Bordeaux plat the sound

[1] An unpublished study of the soft-rot organism by A. B. Massey indicates its probable identity with *Bacillus aroideae* Townsend.

TABLE 1.—*Pounds of sound and unsound fruits from tomato plats on different harvest dates, 1918.*

Date	Plat A Soap Bordeaux		Plat B Bordeaux		Plat C Check	
	Sound	Unsound	Sound	Unsound	Sound	Unsound
Aug. 14	16		7		6	6
Aug. 17	27	2	19	1	14	6
Aug. 22	42	3	19	1	32	8
Aug. 26	53	6	19	2	33	18
Aug. 29	51	2	21	2	49	10
Sept. 2	283	56	152	136	85	185
Sept. 6	54	15	54	41	41	47
Sept. 11	54	5	53	10	88	20
Sept. 14	27	3	13	4	30	10
Sept. 18	82	10	78	7	97	8
Sept. 23	128	3	98	3	53	7
Sept. 26	16		13		14	
Totals	833	105	546	207	542	325

fruit greatly exceeded the unsound with a ratio of 5 to 1. A study of the climatic conditions which preceded this period indicates that rainfall was the most important factor in the development of soft-rot. The total rainfall from August 24 to 31 was 3.88 inches, distributed as follows: Aug. 24, .56; Aug. 26, 1.19; Aug. 27, 1.09; Aug. 28, .02; Aug. 31, 1.02. The mean temperature for this period was slightly higher than that of the preceding and succeeding portions of the harvest period, except for the 5-day period from August 12 to 17, which had a daily average mean of 75.6° F. The means for each 5-day period of the harvest are indicated in Figure 1 which also shows the daily precipitation and the yields of unsound fruit from the soap Bordeaux and check plats on the different harvest dates.

At the end of harvest the plants in plats A and B were well loaded with green fruit most of which was mature in size and would undoubtedly have ripened except for the early frost. There were 437 pounds of such fruit on plat A and 424 pounds on plat B, while the check plat yielded only 47 pounds.

It is evident that the increase in ripe fruit from the soap Bordeaux applications was due chiefly to prevention of soft-rot rather than to control of leaf-blight. Plat A yielded 833 pounds of sound, ripe fruit, a gain of 291 pounds over the check and of 287 pounds over plat B. The results of leaf-blight control are shown in the yields of sound green fruit, an increase in plat A of 490 pounds and in plat B of 377 pounds. The yield of ripe fruit for plat A, calculated on the acre basis, was approximately 278 bushels; the gain from spraying approximately 97 bushels per acre, an increase of 54 per cent over the yield of the check plat.

FIELD TESTS AT AMSTERDAM

A field test of soap Bordeaux was conducted during the same season under the general supervision of the writer on the farm of Mr. H. D. Didier, near Amsterdam, Virginia. The sprayed field contained 2.26 acres and was set on June 10, 11 and 12. The plants were set 3 feet apart in the row with 6 feet between rows to permit passage of the sprayer through the field without injury to the vines. All applications were made with an orchard power sprayer using two leads of hose equipped with short rods and angle nozzles. Soap Bordeaux was used throughout the five applications, which were made on July 15, 25, August 8, 17 and 27. In all 2,050 gallons of material were applied, or 907 gallons per acre for 5 applications; an average of 181 gallons per acre per application. The cost of the spray material (bluestone @ 14c, soap @ 5½c and lime @ 1½c) was $1.43 per 100 gallons, or $2.59 per acre per application. The time required in preparing and applying the sprays was 81 man hours and 54 horse hours, and the total labor cost (man hours @ 20c, horse hours @ 10c) was $21.60 or an average per acre of $1.91 for each application.

An adjoining section of the same field served as the only available check. The area of this portion was 5.19 acres. The plants were of the same varieties and from the same plantbed as those used in the sprayed field, but they were set approximately three weeks earlier, May 15 to 28. The spacing in this field was the common planting distance for that section 3.5 by 3.5 feet. The difference in dates of transplanting and spacing between the two fields naturally makes comparisons between them open to some question. It would seem, however, that the advantage would be in favor of the unsprayed portion. It is generally true that the earlier fields in that section produce the highest yields.

Leaf-blight was very prevalent and destructive in the unsprayed field. The plants suffered early defoliation and reduction in yield must have been very considerable from this source. No other disease of importance was present during the season. The contrast between the sprayed and unsprayed vines was very marked. The former retained their foliage until killed by frost and were well loaded with green fruit at that time. There was practically no green fruit on the unsprayed vines at the end of harvest and most of them were completely defoliated due to the leaf-blight attack. This condition was general for unsprayed tomato fields in the neighborhood.

The yield of the unsprayed field was 354 bushels or 68.2 bushels per acre, while that of the sprayed field was 327.5 bushels or 144.9 bushels per acre, a difference in favor of the sprayed field of 76.7 bushels per acre. In the opinion of the writer this difference is to be attributed to control of leaf-blight by the soap Bordeaux. There were no fields in

that section observed by the writer which compared with the sprayed field in yield. The average of unsprayed fields certainly did not exceed 75 bushels per acre.

The cost of spraying, $1.91 for labor and $2.59 for materials, was $4.50 per acre per application, or $22.50 for the season. The gross returns from spraying at a valuation of 60 cents per bushel, the average price for that season in the locality, were $46.02 and the net returns $23.42 per acre.

Spraying Experiments in 1919

The spraying experiments of 1919 were conducted at the Appomattox County Station, at Appomattox, Virginia, by the superintendent, B. G. Anderson. The tests were planned to determine the efficiency of soap Bordeaux in the control of leaf-blight in that section and were conducted on a sufficiently large scale to make them comparable to farm conditions. Three separate fields were used in the work.

Field No. 1.—The field was one acre in size, half being set with the Columbia variety and half with Arlington. (Columbia and Arlington are wilt-resistant selections of Greater Baltimore). The date of transplanting was June 14 and the planting distance 3 by 6 feet. The fertilizer was applied with a drill using 638 pounds to the acre of a mixture of nitrate of soda, dried blood, sulfate of potash and acid phosphate, the formula being 3-8-1. Four cultivations were given during the early part of the season.

Each varietal plat was divided equally, one-half receiving applications of soap Bordeaux on July 14 and August 2, and the other half serving as a check. A barrel sprayer was used in applying the sprays. It had been the intention to make five spray applications, but three were omitted owing to continued rainfall.

Leaf-blight was severe on the unsprayed plants, while the sprayed plants showed a fair control of infection. The yields as computed on the acre basis are shown in Table 2.

Field No. 2.—The field was one acre in size and was set with the Norton variety. In one-half of the field the planting distance was 4 by

TABLE 2.—*Yields of sprayed and unsprayed tomatoes at Appomattox, Virginia. Columbia and Arlington varieties.*

Variety	Bushels per acre		Spraying increase	
	Sprayed	Check	Bushels	Percentage
Columbia	186	122	64	52
Arlington	161	80	81	101

5 feet and in the other half 3 by 4 feet. The date of transplanting was June 14 and three cultivations were given subsequent to planting. The fertilizer application was the same as in field No. 1.

Each of the two halves of the field with separate planting distances were subdivided equally into a sprayed and check plat. Soap Bordeaux mixture was used and the applications were made with a barrel sprayer on July 14 and August 4. The benefit of spraying was more apparent here than in field No. 1, the sprayed plants showing considerably greater freedom from leaf-blight than did the checks. The yields are shown in table 3.

TABLE 3.—*Yields of sprayed and unsprayed tomatoes and the effect of planting distance on yield at Appomattox, Va. Norton variety.*

Planting distance	Bushels per acre		Spraying increase	
	Sprayed	Check	Bushels	Percentage
3x4	242	117	125	107
4x5	149	79	70	89

The 3 by 4 planting gave higher yields than the 4 by 5 in both sprayed and unsprayed areas of the field. The difference in the sprayed area was 93 bushels per acre, an increase of 62 per cent over the yield of the 4 by 5 planting, and that in the unsprayed area was 38 bushels, an increase of 47 per cent.

Field No. 3.—This field provided a comparison of the yield of the Bonny Best and Stone varieties in sprayed and unsprayed areas. The field was three acres in size, one-half being set with Bonny Best and one-half with Stone. The planting distance was 3 by 6 feet and the date of transplanting June 6. The fertilizer application was the same as in field No. 1 and four cultivations were given. Each varietal area was subdivided into two plats, a one acre sprayed plat and a one-half acre check plat. Soap Bordeaux was applied with a barrel sprayer on July 8 and July 31. The contrast in severity of leaf-blight injury was markedly in favor of the sprayed plants. Yields are shown in Table 4.

TABLE 4.—*Yields of sprayed and unsprayed tomatoes at Appomattox, Va. Bonny Best and Stone Varieties.*

Variety	Bushels per acre		Spraying increase	
	Sprayed	Check	Bushels	Percentage
Stone	192	116	76	65
Bonny Best	125	91	34	37

Summary of Spraying Experiments

The results of the experiments of 1918 and 1919 indicate that spraying with soap Bordeaux mixture provides a satisfactory control of leaf blight and bacterial soft-rot. The increase from spraying in the 7 separate tests included in these years, which are summarized in Table 5, ranged from 34 to 125 bushels per acre and the percentage increase from 37 to 107 per cent.

TABLE 5.—*Summary of results in tomato plats sprayed with soap Bordeaux.*

Year	Variety	Bushels per acre		Percentage
		Total	Increase	Increase
1918	Norton	278	97	54
1919	Norton	242	125	107
1919	Norton	149	70	89
1919	Stone	192	76	65
1919	Arlington	161	81	101
1919	Columbia	186	64	52
1919	Bonny Best	125	34	37

The practicability of spraying will be determined by the value of the crop increase obtained and the cost of producing it. On the basis of these experiments it may be assumed that spraying with soap Bordeaux will result in an average increase for the middle and western sections of Virginia of 70 per cent. Since the average yield of unsprayed tomatoes is about 100 bushels per acre this would indicate an average increase from spraying of 70 bushels per acre. The cost of spraying will vary with local conditions. It involves the availability of water, the topography of the land, the type of sprayer employed and the cost of labor and materials. A fair average estimate of cost under present conditions is believed to be about $3.00 per acre per application for machine spraying and $4.00 per acre for hand spraying. At a valuation of 30 cents per bushel, an increase of 70 bushels per acre would about cover the cost of spraying and labor in harvesting the larger crop. Any increase in price above 30 cents would show a profit.

Control of Late Blight with Copper-Lime Dust in 1922

The tests were conducted at Blacksburg, Virginia, on the farm of the Agricultural Experiment Station during the season of 1922, with the view of determining the value of copper-lime dust in the control of the diseases of tomato occurring in the locality.

The variety Bonny Best was used throughout the tests of 1922. The seedlings were grown in the greenhouse and were transplanted in the

bed of the greenhouse on May 15 and set in the field on June 5. The field used had not grown tomatoes for some years previously, if at all. Soil preparation in advance of planting was thorough and the abundant rainfall which immediately followed transplanting started the plants into a quick, vigorous growth. Rainfall throughout the season was abundant and well distributed. The plants received three horse cultivations and one thorough hand hoeing.

The field was 90 feet in width and 153 feet in length, slightly less than one-third of an acre. The plants were set in rows, 5 feet apart, running lengthwise the field; there being 16 rows in all. Each row contained 50 plants set 3 feet apart. The field was subdivided into a single series of 10 plats of equal size, each plat containing 80 plants, 5 plants in width and 16 plants in length. Such a subdivision, crosswise the rows was necessary to equalize conditions in the field and the number of small plats thus provided gave an adequate check on the results. Dusted and check plats alternated throughout the series. Plats 1, 3, 5, 7 and 9 received similar dust applications, while plats 2, 4, 6, 8 and 10 received no dust or spray material and served as checks.

The dust material used was the Dosch copper-lime dust, containing 20 per cent monohydrated copper sulphate. It was applied with a hand duster, 7 applications in all being made on each dusted plat on the following dates: June 19, 26, July 3, 17, 27, August 5, 16. The number of days elapsing between each dust application was as follows: 7, 7, 14, 10, 9, 11. Sufficient material was used at each application to cover the vines thoroughly but overloading was avoided so far as possible. The quantity of dust used averaged about 7 pounds per application for the 5 dusted plats. This is at the rate of approximately 42 pounds per acre per application, or 294 pounds per acre for 7 applications. At the current price of $8.50 per 100 pounds the cost of material was $25.00 per acre, or $3.57 for each application.

Early blight *(Alternaria solani)* was the first disease to appear. It was of minor importance and did not become severe at any time during the season. Leaf-blight did not appear until late in the season and its presence did not apparently affect the yields of either dusted or check plats.

The first appearance of late blight *(Phytophthora infestans)* was noted on August 5. For a few days infection was confined chiefly to the foliage, but by August 9 fruit infection was present in both check and dusted plats, the percentage of infected fruit in the checks being greatly in excess of that found in the dusted plats. Examination of 600 fruits per plat from two check and two dusted plats on this date gave results as shown in Table 6, the percentage of infected fruits averaging 10.4 for the checks and 1.7 for the dusted plats.

TABLE 6.—*Comparison of Phytophthora infection of tomato fruits from check and dusted plats on August 9.*

Plat No.	Treatment	No. fruits examined	Affected with Phytophthora	
			Number	Per cent.
5	Copper-lime dust	600	11	1.8
6	None	600	42	7.0
9	Copper-lime dust	600	9	1.5
10	None	600	83	13.8

Phytophthora continued to develop vigorously for the remainder of the month of August and during the first week in September as shown by the harvest data in Table 7. Practically all of the rotting of fruit occurring from August 9 to September 6 was caused by late-blight. The harvest of ripe fruits was terminated on September 13 and on the 15th the remaining green fruits were harvested and the number of sound and unsound fruits determined. Approximately one-third of the rots of green fruit in the dusted plats at this date were due to Phytophthora and approximately one-half of those in the checks. The remaining rots were caused by bacterial soft-rot. The chief cause of unsoundness on the different harvest dates during the season is shown in Table 7. Phytophthora was primarily responsible for 78 per cent of the fruit rot in the dusted plats and for 96 per cent of that in the checks. The total number of unsound fruits in the checks was 5,088, and that in the dusted plats 1,584, a decrease of 69 per cent attributable to dusting.

TABLE 7.—*Number of unsound tomato fruits harvested from dusted and check plats on different harvest dates.*

Date	July		August						September			Total
	19	31	1	4	7	9	20	28	6	15	15	
Cause of defect	Fruit worm		Soft-rot			Phytophthora					Soft-rot	
Dusted	14	19	11	1	4	20	188	486	388	149	304	1584
Checks	4	11	5	8	2	125	1846	1845	820	223	199	5088

The harvest of ripe fruit extended from July 31 to September 13, the bulk of the crop being obtained during the period of 19 days from August 28 to September 13. The yield in pounds for the combined plats throughout the season is shown in Table 8, and the total yield of ripe fruit by individual plats is shown in Table 9. These yields are also expressed graphically in figure 2. The yield of sound, ripe fruit for the dusted plats was 2,688 pounds, and that for the checks 1,556; an increase

from dusting of 1.132 pounds, or 72.7 per cent. The proportionate increase in green fruit, harvested September 15, was considerably greater than that of ripe fruit, the yield of the dusted plats being 256 pounds and that of the checks 72 pounds.

The increase of 1,132 pounds of ripe fruit obtained by dusting is to be attributed almost entirely to control of Phytophthora rot on the fruit and to only a slight extent, if at all, to control of foliage infection by

TABLE 8.—*Pounds of sound, ripe tomatoes from dusted and check plats.*

Date	July	August													
	31	2	4	6	8	10	12	14	16	18	20	22	24	28	30
Dusted	8	13	10	13	12	19	44	83	53	82	74	70	65	355	249
Check	16	10	14	15	24	25	51	98	39	66	46	48	41	253	176

Date	September						Tot'l
	2	4	6	9	11	13	
Dusted	458	299	334	172	182	93	2688
Check	200	133	123	82	60	36	1556

TABLE 9.—*Total yield of sound and unsound fruits by individual plats.*

Plat No.	Treatment	Number of fruits: Total	Ripe & sound	Unsound	Percentage Unsound	Percentage of control
1	dusted	1621	1347	274	16.9	67.9
2	check	1959	929	1030	52.6	
3	dusted	1838	1503	335	18.2	63.3
4	check	1882	995	887	46.6	
5	dusted	1728	1439	289	16.7	63.9
6	check	1902	1029	873	45.9	
7	dusted	1962	1687	275	14.0	73.2
8	check	1725	716	1009	58.5	
9	dusted	1508	1097	411	27.3	59.2
10	check	1715	426	1289	75.2	

TABLE 10.—*Comparative yields of ripe, green, and unsound fruits from dusted and check plats.*

Classification	Number of fruits*: Dusted	Check
Sound, ripe fruit	7074	4095
Sound, green fruit	673	189
Unsound fruit	1584	5088
Total	9331	9372

* The number of sound fruits was determined by calculation from the recorded weights. The weight of the average fruit was 0.38 pounds.

Phytophthora or Septoria. This is shown by the close agreement in total number of fruits produced in the check and dusted plats (table 10). The percentage increase in sound ripe fruit (72.7 per cent) obtained by dusting also agrees closely with the percentage of decrease in unsound fruit (69 per cent).

The range in severity of fruit infection between plats is shown in Table 9. The percentage of unsound fruits in the dusted plats ranged between 14.0 (plat 7) and 27.3 (plat 9), and between 45.9 (plat 6) and 75.2 (plat 10) in the check plats. The average percentage of unsound fruits in the dusted plats was 18.3 as compared with 55.4 for the checks. The percentage of control of fruit rot from dusting ranged between 52.9 and 73.2, the determination being based on the average of the two adjoining checks, except for plat 1 with only one check adjoining.

If the yields are calculated on the acre basis, the yield from the dusted plats was approximately 269 bushels per acre (1 bushel = 60

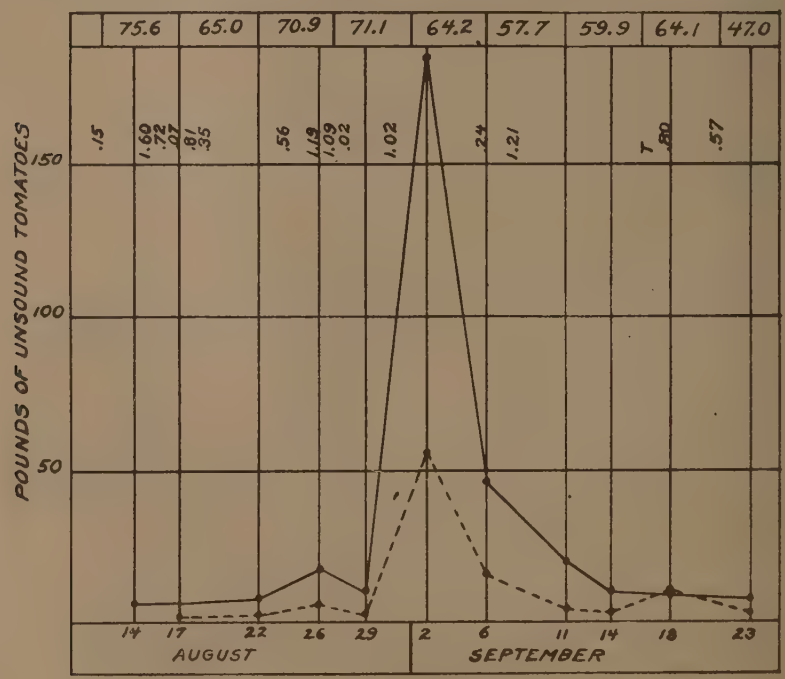

FIG. 1.—Yield of unsound tomatoes (pounds) from spray and check plats at Blacksburg in 1918. Check plat indicated by solid line, soap Bordeaux plat by broken line. Figures at top show mean temperature by five-day periods; figures below these show daily precipitation.

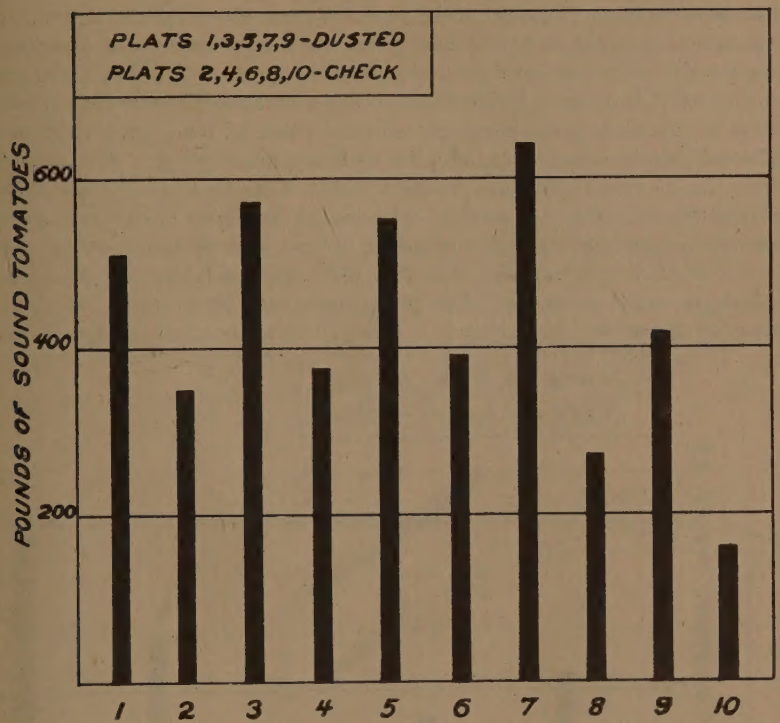

FIG. 2.—Yield of sound, ripe tomatoes (pounds) from dusted and check plats, 1922.

pounds) and that of the check plats approximately 156 bushels per acre; a gain of 113 bushels per acre from dusting.

It seems apparent that not more than 3 of the 7 dust applications had any part in the control of Phytophthora. The first 4 applications were made well in advance of the advent of the disease, which first appeared on August 5, and the degree of control obtained can be attributed to the last 3 applications made on July 27, August 5 and August 16.

Discussion of Dusting Results

The control of late-blight obtained in these tests is considered a very satisfactory showing for the copper-lime dust, especially so in view of the fact that the dusted plats were exposed to a constant and nearby source of spores of the fungus in the checks. It seems probable that somewhat better results may be expected in farm practice where no checks are maintained. The dusting method appears to offer a practical means for the control of late-blight and its use in sections where this

disease occurs would appear to be justified from the results obtained. In Virginia late-blight is found chiefly in the higher altitudes; it occurs practically every year in destructive form in the counties that lie to the southwest of Roanoke. Although there are comparatively few commercial fields in this section the home garden production of tomatoes is a matter of considerable importance, and the rather general failures of tomatoes there due to late-blight have brought many inquiries to this Experiment Station for an effective remedy. Although it has been shown that good control of late-blight may be obtained by spraying with Bordeaux mixture (Virginia Agr. Exp. Sta. Bul. 213. 1916), this method is not practiced except in rare instances. The preparation and application of spray material for small operations is a task which most home gardeners are

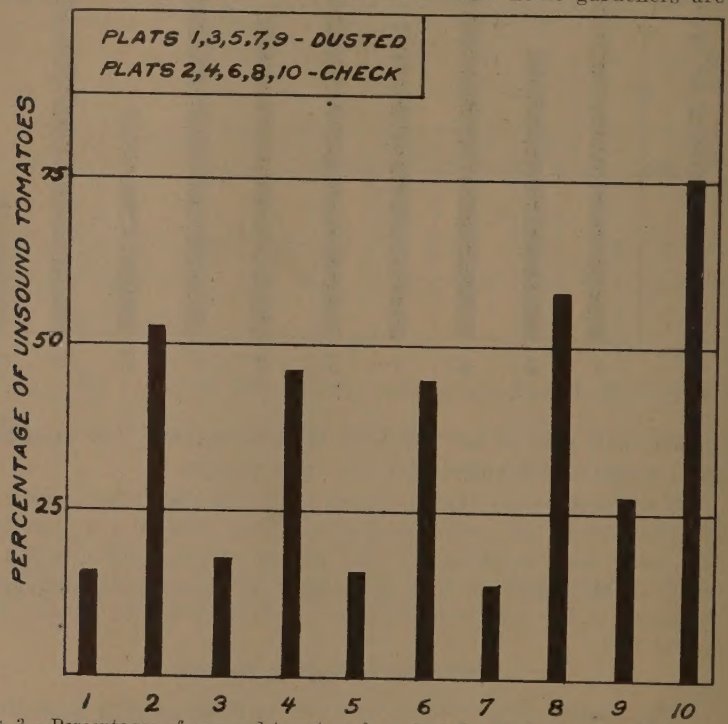

FIG. 3.—Percentages of unsound tomatoes from dusted and check plats, 1922.

not willing to undertake and the dusting method should prove much more attractive from the standpoint of labor and convenience. From the standpoint of cost there is probably not much choice between the two methods, the higher cost of the dusting materials being offset by the saving in labor.

It is impossible to supply figures on the cost of dusting from our experiments which will be generally applicable. The amount of material needed will probably range from 40 to 50 pounds per acre per application, and it should be possible to secure results as good as those obtained in our tests with three or four properly timed applications. The cost of applying the material will vary with the type of duster employed. Machinery is now available to handle any acreage. The hand duster gives good distribution of the material and is suitable for home gardens or for fields of one or two acres. Traction or power dusters may be employed for larger acreages.

No data as to the value of copper-lime dust in the control of leaf-blight and other diseases of tomatoes are available. Such information as we have does not indicate that dusting would equal the efficiency of soap Bordeaux in leaf-blight control. The practicability of dusting for sections where late-blight does not occur remains to be determined.

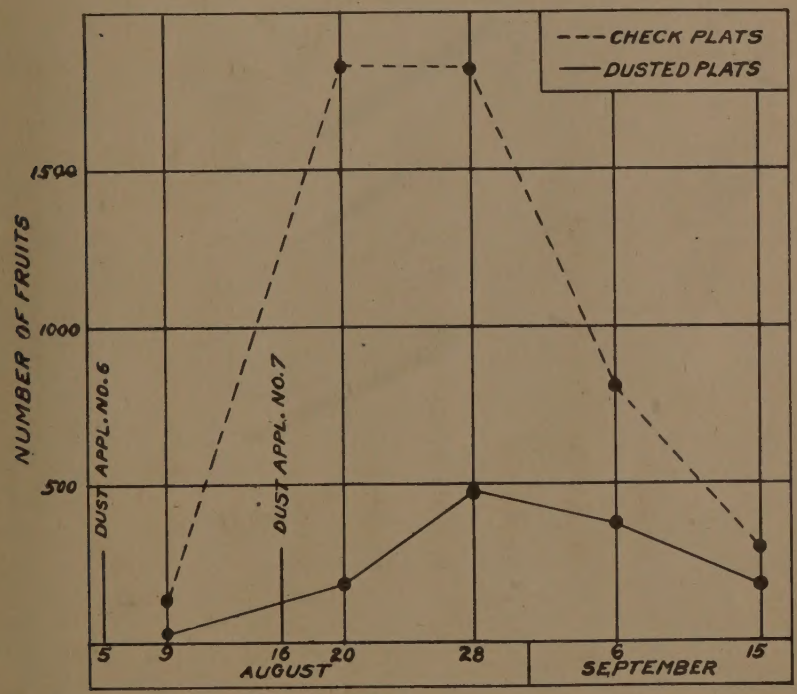

FIG. 4.—Number of tomatoes from dusted and check plats affected with Phytophthora rot on different harvest dates, 1922.